

DESCRIPTION

The TS117 is a 350V, 120mA, 35Ω type 1-form-A solid state relay for hookswitch combined with an optocoupler for detection of loop current or ringing signal in a single 8-pin DIP package. Current limiting version available. ("L" suffix).

FEATURES

- Small 8-Pin DIP Package
- Low Drive Power Requirements (TTL/CMOS Compatible)
- No Moving Parts
- High Reliability
- Arc-Free With No Snubbing Circuits
- 3750V_{RMS} Input/Output Isolation Available
- FCC Compatible
- No EMI/RFI Generation
- Machine Insertable, Wave Solderable
- Surface Mount and Tape & Reel Version Available

APPROVALS

- UL Recognized: File Number E76270
- CSA Certified: File Number LR 43639-10
- VDE Compatible
- BSI Certified:
 - BS EN 60950:1992 (BS7002:1992) Certificate #:7344
 - BS EN 41003:1993 Certificate #:7344

OPTIONS / SUFFIXES

- P: Flatpack Available
- L: Current Limiting
- S: Surface Mount Package
- TR: Tape & Reel

TS117/TS117L Pinout



APPLICATIONS

- Telecommunications
 - Telecom Switching
 - Tip/Ring Circuits
 - Modem Switching (Laptop, Notebook, Pocket Size)
 - Hookswitch
 - Dial Pulsing
 - Ground Start
 - Ringer Injection
- Instrumentation
 - Multiplexers
 - Data Acquisition
 - Electronic Switching
 - I/O Subsystems
 - Meters (Watt-Hour, Water, Gas)
- Medical Equipment—Patient/Equipment Isolation
- Security
- Aerospace
- Industrial Controls

RATINGS (@ 25° C)

Parameter	Min	Typ	Max	Units
Input Power Dissipation	-	-	150 ¹	mW
Input Control Current	-	-	100	mA
Peak (10ms)	-	-	1	A
Reverse Input Voltage	-	-	5	V
Total Power Dissipation	-	-	800 ²	mW
Capacitance				
Input to Output	-	3	-	pF
Isolation Voltage				
Input to Output	3750	-	-	V _{RMS}
Operational Temperature	-40	-	+85	°C
Storage Temperature	-40	-	+125	°C
Soldering Temperature (10 Seconds Max.)				
DIP Package	-	-	+260	°C
Flatpack/Surface Mount Pkg	-	-	+220	°C

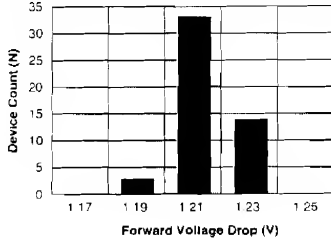
¹Derate Linearly 1.43 mW/°C
²Derate Linearly 1.67 mW/°C

SPECIFICATIONS

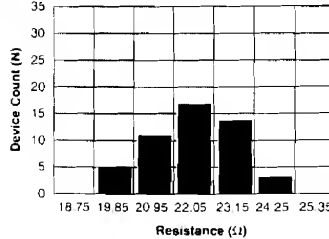
TS117						TS117L			
PARAMETERS	CONDITIONS	SYMBOL	MIN	TYP	MAX	MIN	TYP	MAX	UNITS
Relay Portion (Pins 7, 8) Output Characteristics @ 25 C									
Load Voltage (Peak)	-	V_L	-	-	350	-	-	350	V
Load Current (Continuous)	-	I_L	-	-	120	-	-	120	mA
Peak Load Current	10ms	I_{LPK}	-	-	350	-	-	-	mA
On-Resistance	$I_L = 120\text{mA}$	R_{ON}	-	23	35	-	30	35	Ω
Off-State Leakage Current	$V_L = 350\text{V}$	I_{LEAK}	-	-	1	-	-	1	μA
Switching Speeds									
Turn-On	$I_F = 5\text{mA}$, $V_L = 10\text{V}$	T_{ON}	-	-	3.0	-	-	3.0	ms
Turn-Off	$I_F = 5\text{mA}$, $V_L = 10\text{V}$	T_{OFF}	-	-	3.0	-	-	3.0	ms
Output Capacitance	50V; f = 1MHz	C_{OUT}	-	25	-	-	25	-	pF
Load Current Limit		I_{CL}	-	-	-	130	170	210	mA
Relay Portion (Pins 1, 2) Input Characteristics @ 25 C									
Input Control Current	$I_L = 120\text{mA}$	I_F	2	-	50	2	-	50	mA
Input Dropout Current	-	I_F	0.4	0.7	-	0.4	0.7	-	mA
Input Voltage Drop	$I_F = 5\text{mA}$	V_F	0.9	1.2	1.4	0.9	1.2	1.4	V
Reverse Input Voltage	-	V_R	-	-	5	-	-	5	V
Reverse Input Current	$V_R = 5\text{V}$	I_R	-	-	10	-	-	10	μA
Detector Portion (Pins 3, 4) Output Characteristics @ 25 C									
Phototransistor Blocking Voltage	$I_C = 10\mu\text{A}$	BV_{CED}	20	50	-	20	50	-	V
Phototransistor Output Current	$V_{CE} = 5\text{V}$, $I_E = 0\text{mA}$	I_{CED}	-	50	500	-	50	500	nA
Saturation Voltage	$I_C = 2\text{mA}$, $I_E = 16\text{mA}$	V_{SAT}	-	0.3	0.5	-	0.3	0.5	V
Current Transfer Ratio	$I_E = 6\text{mA}$, $V_{CE} = 0.5\text{V}$	CTR	33	100	-	33	100	-	%
Detector Portion (Pins 5, 6) Input Characteristics @ 25 C									
Input Control Current	$I_C = 2\text{mA}$, $V_{CE} = 0.5\text{V}$	I_F	6	2	100	6	2	100	mA
Input Voltage Drop	$I_F = 5\text{mA}$	V_F	0.9	1.2	1.4	0.9	1.2	1.4	V
Input Current (Detector must be off)	$I_C = 1\mu\text{A}$, $V_{CE} = 5\text{V}$	I_F	5	25	-	5	25	-	μA
Input to Output Capacitance (Relay Only)	-	$C_{I/O}$	-	3	-	-	3	-	pF
Input to Output Isolation	-	$V_{I/O}$	3750	-	-	3750	-	-	V_{RMS}

PERFORMANCE DATA

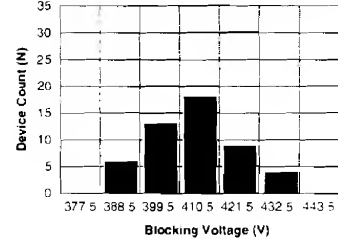
TS117
Typical LED Forward Voltage Drop
(N=50 Ambient Temperature = 25°C; I_F = 5mADC)



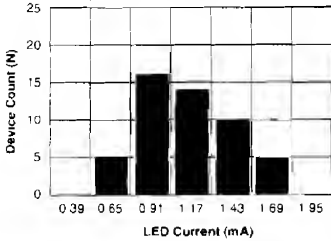
TS117
Typical On-Resistance Distribution
(N=50 Ambient Temperature = 25°C)
(Load: Voltage = 350VDC; Current = 120mADC;
 I_F = 2mADC)



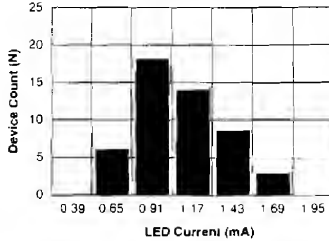
TS117
Typical Blocking Voltage Distribution
(N=50 Ambient Temperature = 25°C)



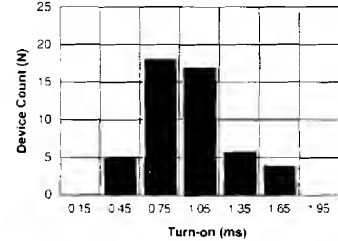
TS117
Typical I_F for Switch Operation
(N=50 Ambient Temperature = 25°C)
(Load Current = 120mADC)



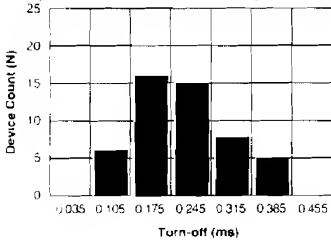
TS117
Typical I_F for Switch Dropout
(N=50 Ambient Temperature = 25°C)
(Load Current = 120mADC)



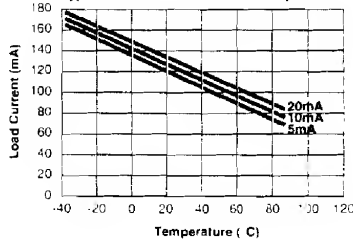
TS117
Typical Turn-on Time
(N=50 Ambient Temperature = 25°C)
(Load Current = 120mADC; I_F = 2mADC)



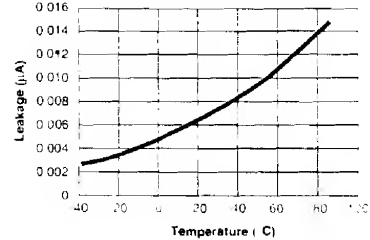
TS117
Typical Turn-off Time
(N=50 Ambient Temperature = 25°C)
(Load Current = 120mADC; I_F = 2mADC)



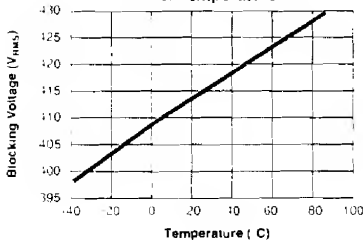
TS117
Typical Load Current vs. Temperature



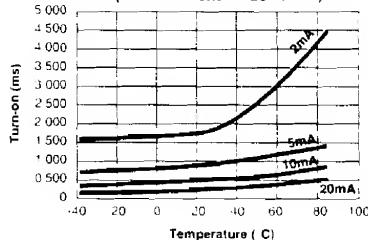
TS117
Typical Leakage vs. Temperature
(Measured across Pins 7 & 8)



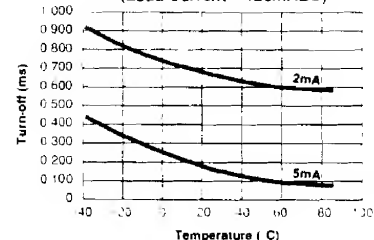
TS117
Typical Blocking Voltage
vs. Temperature



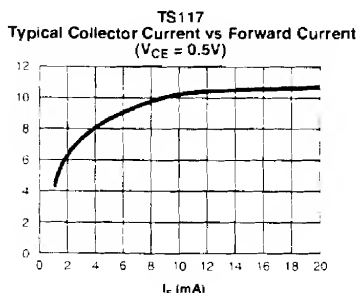
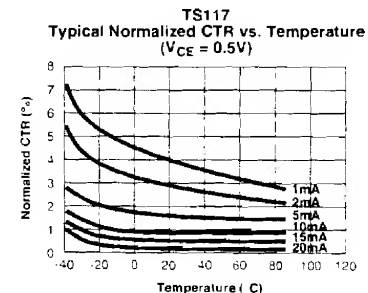
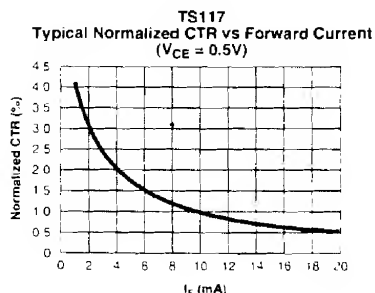
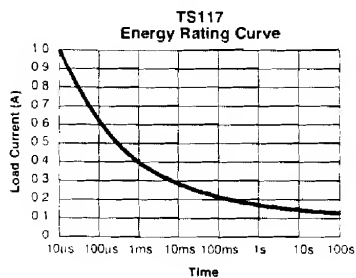
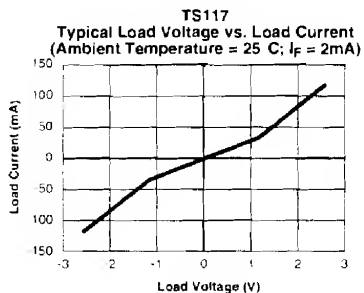
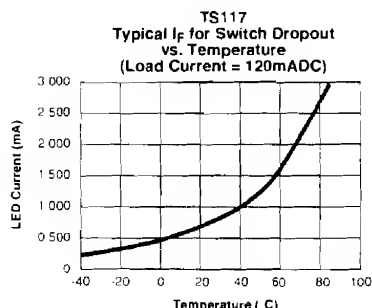
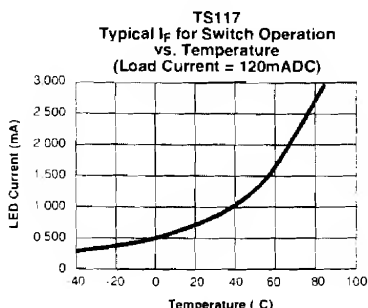
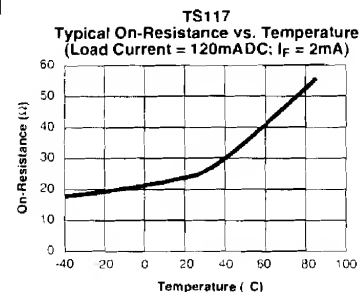
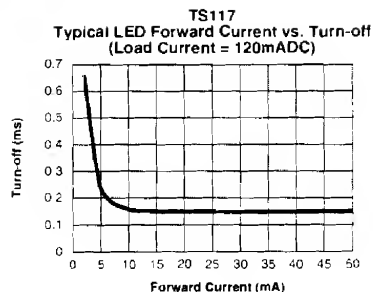
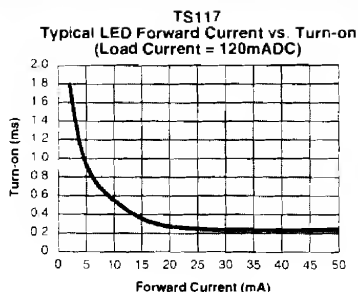
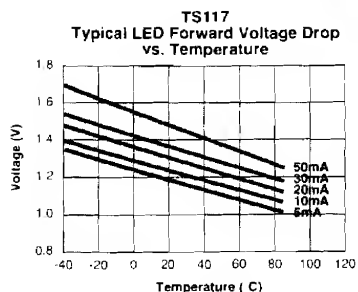
TS117
Typical Turn-on vs. Temperature
(Load Current = 120mADC)



TS117
Typical Turn-off vs. Temperature
(Load Current = 120mADC)

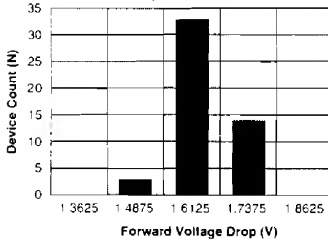


PERFORMANCE DATA

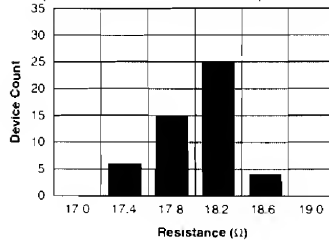


PERFORMANCE DATA

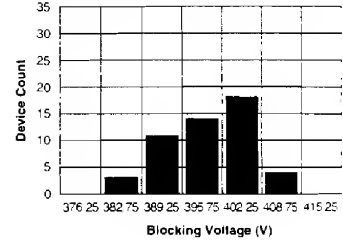
TS117L
Typical LED Forward Voltage Drop
(N=50 Ambient Temperature = 25 °C)
 $I_F = 5\text{mA}$



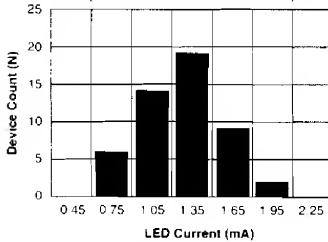
TS117L
Typical On-Resistance Distribution
(N=50 Ambient Temperature = 25 °C)
(Load Current = 120mADC; $I_F = 2\text{mA}$)



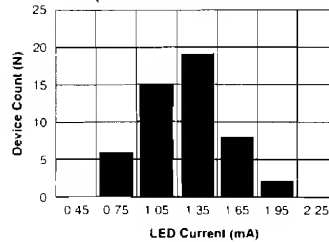
TS117L
Typical Blocking Voltage Distribution
(N=50 Ambient Temperature = 25 °C)



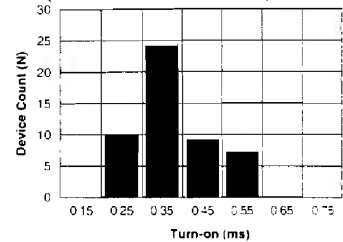
TS117L
Typical I_F for Switch Operation
(N=50 Ambient Temperature = 25 °C)
(Load Current = 120mADC)



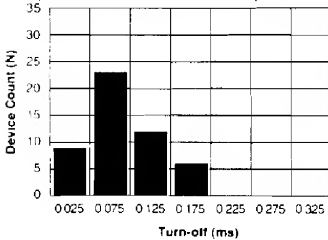
TS117L
Typical I_F for Switch Dropout
(N=50 Ambient Temperature = 25 °C)
(Load Current = 120mADC)



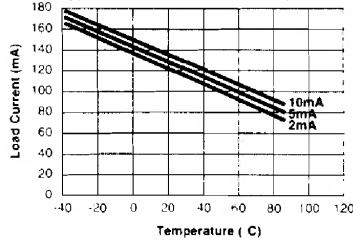
TS117L
Typical Turn-on Time
(N=50 Ambient Temperature = 25 °C)
(Load Current = 120mADC; $I_F = 2\text{mA}$)



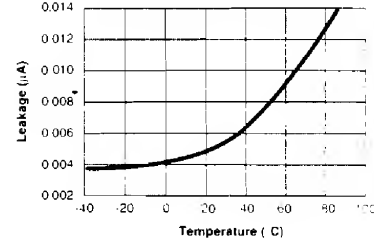
TS117L
Typical Turn-off Time
(N=50 Ambient Temperature = 25 °C)
(Load Current = 120mADC; $I_F = 2\text{mA}$)



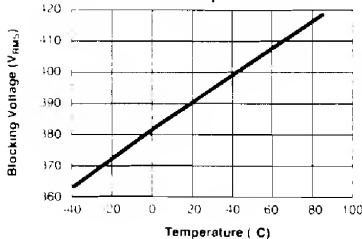
TS117L
Typical Load Current vs. Temperature



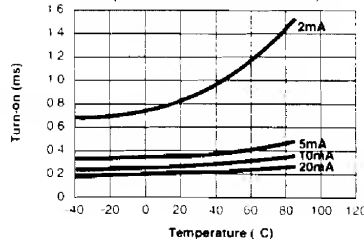
TS117L
Typical Leakage vs. Temperature
(Measured across Pins 7 & 8)



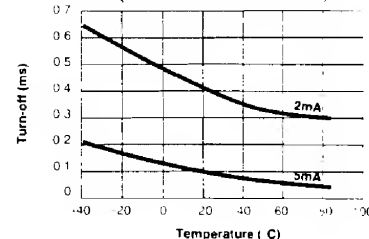
TS117L
Typical Blocking Voltage
vs. Temperature



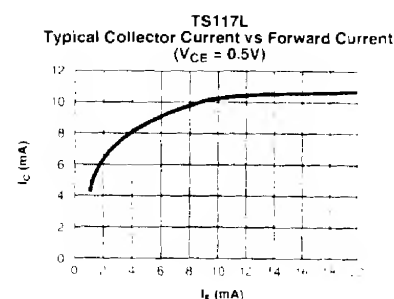
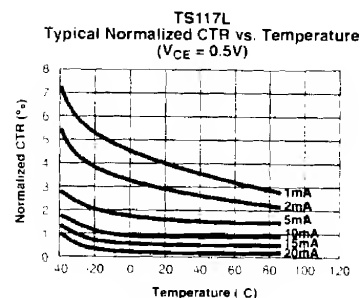
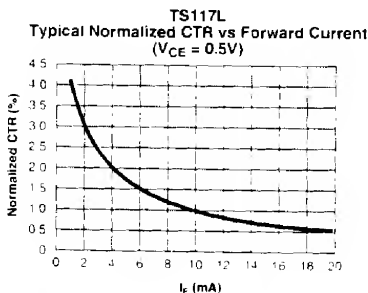
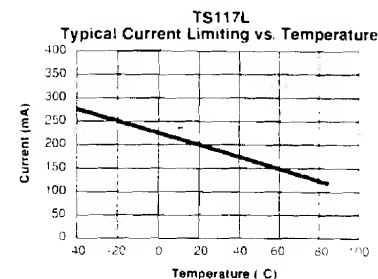
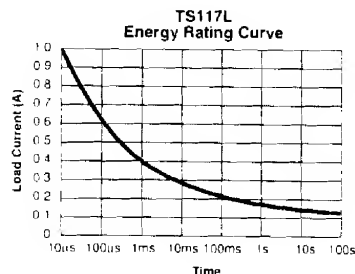
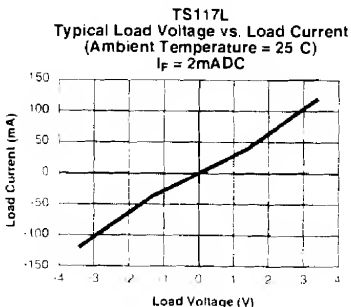
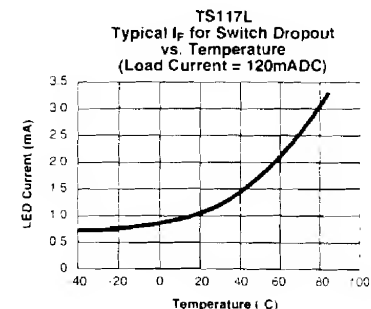
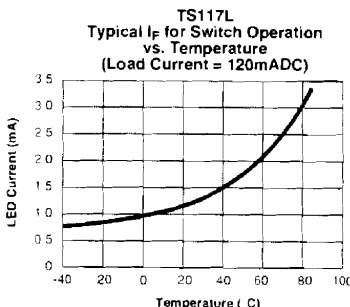
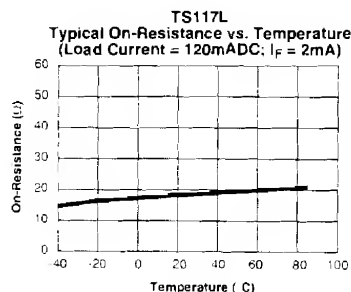
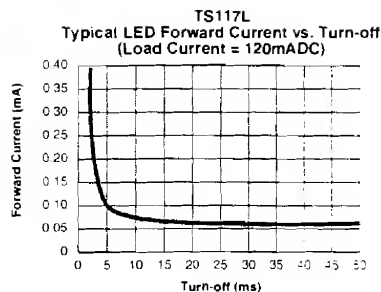
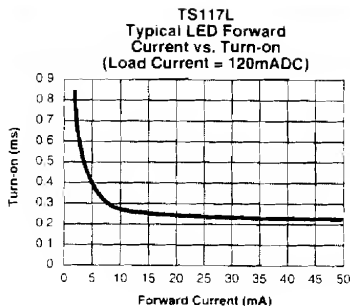
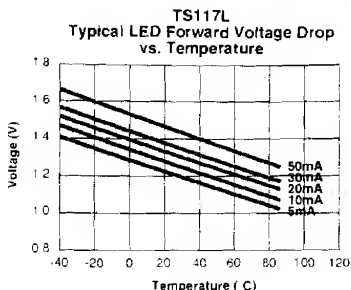
TS117L
Typical Turn-on vs. Temperature
(Load Current = 120mADC)



TS117L
Typical Turn-off vs. Temperature
(Load Current = 120mADC)



PERFORMANCE DATA



TS117 Telecom Switch

SSRS FOR MODEMS

The use of relays in telecom circuits has a long history. Originally, electromechanical relays were the only viable solution for these applications. However, as modems, automatic telephone dialers, fax machines and answering machines continue to expand in the data processing world, the need for state of the art technology in the form of solid state relays (SSRs) has become apparent.

The SSR offers: High Blocking Voltages, High Load Currents, Low On-Resistance, Fast Switching Speeds and Input/Output Isolation of 3750 V_{RMS} , which make them an ideal solution for hookswitch, pulse dialing or loop start switching operations.

Essentially, the modem begins in a standby or idle state in which it is disconnected from the telephone line (See Figure 1). Connection begins when a ring current is detected by the ring detection device (CP Clare: LDA Series or "TS" Series). This device supplies a ring detection signal to the modem circuit which is used to initiate the answer response mode. Once the ring detection signal is recognized and has initiated the answering sequence by generating the ringing indication signal, the modem chip responds with a signal. The off hook signal generated by the modem is used to activate the hookswitch solid state relay (CP Clare: LCA or PLA Series), closing the circuit between the tip and ring wires and connecting the modem to the circuit.

CP Clare offers a wide range of SSRs for the telecom industry. Form A, B, C, single pole or dual pole devices, detailed specifications of which are found on pages 63-264.

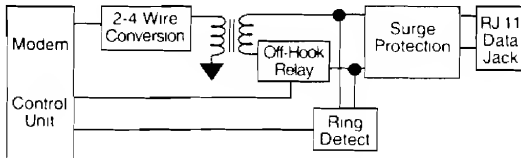


Figure 1. Typical Modem Circuit

Figure 2 is a typical data access arrangement (DAA) design using CP Clare's "TS" Series SSR. The "TS" Series offers an optically isolated normally open (or normally closed) MOSFET based solid state relay, combined with a bi-directionally driven photo-transistor, all in the same 8 pin DIP.

The Ring Detection portion of this circuit uses a capacitor (typical value .68 μ F) and a resistor (typical value 10K Ohms) in a series with the bi-directional LEDs of the TS117, across the Tip and Ring lines of the circuit.

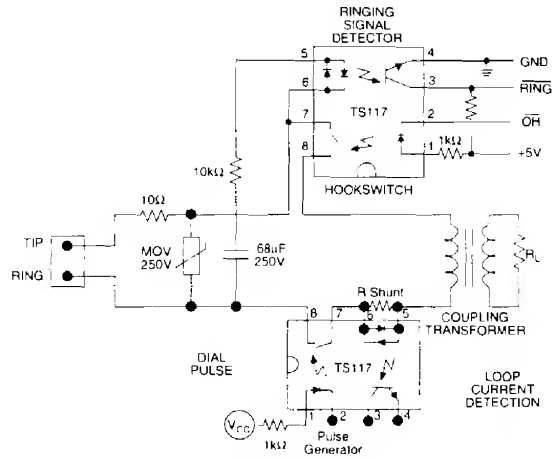


Figure 2. Ring Detector and Loop Detector Circuit

The resistor and capacitor values for the circuit must be chosen to provide sufficient current to operate the detector portion of the TS117 at the required voltage of the ringer service. (For Class B ringer service voltage range of 40 to 150 V_{RMS} and frequency range of 15.3 to 68Hz.)

The impedance of this resistor/capacitor network is critical to the Ringer Equivalence Number (REN). The smaller the impedance the larger the REN and if the REN is too large it will limit the number of telephone devices that can be attached to the line.

The TS117 is sensitive to typical loop currents of 2mA allowing the circuit designer the freedom to program the actual in-circuit triggering current by appropriate choice of input shunt resistance.